REMARKS

Claims 1-12 are pending in the application and were rejected. Claims 1 and 7 are amended herein. In view of the following remarks and the claim amendments, reconsideration of the application is respectfully requested.

Claim Amendments

Claims 1 and 7 have been amended to explicitly state that a modulated signal is "electrically coupled"/"electrically applied" to the cochlea. Although Applicant believes that this limitation was inferred in the previous claim versions, Applicant has made such limitation explicit to expressly exclude an unduly broad reading that would include indirect mechanical coupling and/or indirect mechanical application of a signal to the cochlea.

Support for the amendments can be found, e.g., in Figure 4, which shows electrical coupling and electrical application of a signal to a cochlea. In addition, the specification describes that "the internal unit 132 has at least one active electrode 134 that is inserted into the cochlea 30 through hole 36", (p. 4, ll. 7-9), and:

> The internal unit 132 includes an internal coil assembly 140 for electrically driving the electrode 134. In the preferred embodiment, the internal coil assembly 140 has two ends, one coupled to the active electrode 134, and the other coupled with the reference electrode (not shown). (p. 4, ll. 11-14.)

Additionally, claims 1 and 7 have been amended to clarify that it is the modulated signal that is applied to the cochlea. Descriptive support can be found, e.g., in Figure 7, block 240.

Response to the Section 102 Rejection

Claims 1, 4, 7 and 10 were rejected under 35 U.S.C. § 102(e) as unpatentable over Ball (U.S. Patent No. 6,217,508). Applicant respectfully traverses this rejection as Ball fails to teach all elements of any rejected claim.

With respect to claim 1, although Ball defines an "ultrasonic frequency" as greater than 20 kHz, and describes a nebulous "frequency transposition", Ball does not describe generating an electrical analog carrier signal having a frequency greater than 20 kHz, and modulating the carrier signal with a sound signal, as claimed. The specific references to Ball relied on in the rejection do not teach these claim limitations.

Perhaps even more significant, nowhere in Ball can one find a description corresponding to the claim 1 limitation "applying the modulated signal to an electrode that is

electrically coupled with the cochlea such that the carrier signal is applied to the cochlea". Element 100, which the rejection refers to as an "electrode", is described consistently throughout Ball as a "floating mass transducer" (FMT), which Ball defines as a mechanical vibration device that has a floating mass "that vibrates in direct response to an external signal which [sic] corresponds to sound waves". (Ball, col. 4, ll. 30-37.) Clearly, an electrical-to-mechanical transducer is not an electrode, as it is electrically isolated from surrounding structure, and uses electrical power to cause physical displacement of a mass. Ball's FMT is taught as attached to a vibrating structure such as an ossicle or to a component of the skull, not to the cochlea, so that even were it not electrically isolated, it would not be electrically coupled to the cochlea.

With respect to claim 7, similar arguments apply. Ball teaches no electrode for electrical coupling with a patient's cochlea, no oscillator as claimed, and no modulator as claimed. With respect to claim 4 and 10, as Ball teaches no analog carrier, he certainly does not teach that such a carrier has a frequency of at least 32 kHz.

Response to the First Section 103 Rejection

Claims 2, 3, 5, 6, 8-9, and 11-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ball, with the Examiner taking Official Notice that "amplitude-modulation, frequency-modulation and phase-modulation are all well known in the art and would have been obvious for the purpose of transmitting the received ambient sound to the direct-drive cochlear electrode (100)". Applicant respectfully traverses this rejection, as based at least on the arguments presented in the section above, a *prima facie* case of obviousness is absent.

Applicant first objects to the characterization of Ball's FMT as a "cochlear electrode". This is clearly neither taught nor suggested by Ball. Further, however, it is unclear to Applicant that frequency-modulation and/or phase-modulation are well known for electrical stimulation of the cochlea—Applicant respectfully requests that the Examiner provide a specific reference showing such a teaching. It is noted that Lenhardt, cited by the Examiner, specifically teaches that frequency modulation did *not* work for bone conduction vibratory-type devices. (Lenhardt, col. 6, ll. 34-36.)

In any event, these claims are allowable at least for the reasons presented above for the patentability of their parent claims.

Response to the Second Section 103 Rejection

Claims 1-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Applicant's Admitted Prior Art (APA) in view of Ball. Applicant respectfully traverses this rejection, as a *prima facie* case of obviousness is lacking.

The rejection states that the APA teaches the elements of claims 1 and 7, except for the limitation that the carrier signal has a frequency greater than 20 kHz. The rejection then continues:

> Shown in Figure 1, Ball teaches a cochlear implant with a carrier signal having a frequency greater than 20 kHz (column 2, lines 48-61). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of the APA and Ball for the purpose of transmitting a wider range of frequencies directly to the cochlea of the user, also resulting in clearer speech perception (Please see LENHARDT-US 5,047,994 which BALL has incorporated by reference).

Applicant respectfully disagrees. Neither Ball nor Lenhardt teach *cochlear implants*, nor do they teach "transmitting a wider range of frequencies directly to the cochlea of the user". Lenhardt, in particular, teaches supersonic bone conduction to the saccule, to allow some hearing in patients who are nerve deaf. (Lenhardt, col. 2, ll. 3-45.) Although Ball teaches a similar method of bone conduction as Lenhardt, Ball adds embodiments with vibrating transducers attached to moveable components of the middle ear, but not to the inner ear. The teachings of Lenhardt and Ball do not extend beyond vibratory systems and methods. Accordingly, there is no suggestion in the references for electrically coupling/applying a modulated ultrasonic carrier to the cochlea. Thus the combination of APA and Ball/Lenhardt fail to teach applying a modulated ultrasonic carrier to the cochlea, as claimed, and a *prima facie* case of obviousness is lacking. Further, there is no suggestion that ultrasonic vibratory techniques can be applied to electrical stimulation of the cochlea.

The dependent claims are patentable at least for the reasons presented above. Further, and as discussed in the preceding section, Applicant respectfully disagrees that frequency modulation and phase modulation of cochlear electrodes are well-known in the art, and requests that the Examiner provide a reference to support this assertion.

CONCLUSION

In view of the arguments and amendments presented above, Applicant respectfully requests that the claim rejections be withdrawn, and that claims 1-12 be allowed to proceed to issuance. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

MARGER JOHNSON & McCOLLOM, P.C.

James E. Harris
Reg. No. 40,013

MARGER JOHNSON & McCOLLOM
1030 SW Morrison Street
Portland, OR 97205
(503) 222-3613

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Thrice Amended) A method for stimulating a human cochlea in response to a sound, comprising:

generating an electrical sound signal in response to the sound;

generating an electrical analog carrier signal having a frequency greater than 20 kHz;

modulating the carrier signal with the sound signal to generate a modulated signal; and

applying the modulated signal to an electrode that is electrically coupled with the cochlea such that the modulated [carrier] signal is applied to the cochlea.

7. (Thrice Amended) A cochlear implant system for a patient's cochlea comprising:

at least one electrode for electrical coupling with the patient's cochlea;

an internal coil for implanting in the patient to drive the electrode;

a microphone for outputting electrical sound signals in response to external sounds;

an oscillator for generating an electrical analog carrier signal having a frequency greater than 20 kHz;

a modulator for modulating the carrier signal with the sound signals to generate a modulated signal; and

an external coil for magnetically coupling the modulated signal to the internal coil such that the [carrier and the] modulated signal [are] is electrically applied to the cochlea.